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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

TECHNICAL MEMORANDUM. 127

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POTENTIALITIES OF THE PARACHUTE.

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Laboratory.

August, 1922.



## POTENTIALITIES OF THE PARACHUTE.

By Edward P. Warner.

The development of the use of the parachute within the last eight years has been nothing less than amazing. Viewed at the beginning of the war as an accessory to foolhardy exhibitions and totally without practical use, it has come to be recognized as an essential part of the equipment of every military balloonist and it is rapidly assuming a place in connection with the airplane as important in its way as that which it has held for some time in the domain of the lighter-than-air craft. There are stringent limitations on its use, however, limitations which can hardly be understood without knowledge of the type of parachute used in aircraft and of the circumstances under which it is liable to be called into play. To avoid misunderstanding and the building of false hopes on the efficiency of the parachute as a safety device under all conditions, some analysis of these subjects must be undertaken.

The function of the parachute is always the same, to offer an air resistance sufficiently large so that the maximum possible speed of vertical fall will be low enough for the safety of the person making the descent. The rate of descent ordinarily considered to be safe is about 12 feet a second, a velocity equal to that which would be acquired in jumping (without a parachute) from a table 2 1/4 feet in height. This may seem an extremely low limit to select, since a jump from an elevation three or four

\* From "Christian Science Monitor," July 3, 1922.

times as great as that just mentioned would involve no danger. Parachutes are sometimes designed for somewhat higher velocities when the weight and bulk of the safety device have become important considerations and must be cut to the lowest possible point, but it is well to keep the limiting speed of fall extremely low for two reasons.

Allowing for Wind.

In the first place, there is always the possibility of vertical currents of air which will catch the parachute and accelerate its downward progress beyond the highest rate possible in still air, and an ample margin of safety should therefore be left in calculating the size of the huge fabric umbrella whose function it is to check the descent.

Second, and no less important, the parachute is drifting freely with the wind as long as it is in the air, and the passenger has comparatively little control over the direction and rate of its horizontal motion. A little steering can be accomplished by pulling down part of the suspension cords so that the parachute itself will tilt and tend to slide in the desired direction but the control is not a powerful one. When a jump has to be made in a strong wind, therefore, the parachute reaches the ground with a horizontal speed which may be 30 miles an hour or more, and the rate of vertical fall must be kept to a minimum in order that the jumper may keep his feet as well as possible after striking and quickly extricate himself before he has been dragged a long distance along the ground.

To keep the rate of fall down to 12 feet a second requires, for a 180-pound man, a parachute roughly 28 feet in diameter, and that is about the standard size, approximately 20 feet being the minimum.

#### At Balloon Exhibitions.

Every one is familiar with the type of parachute used in balloon exhibitions and with the general method of using it. It is an open bag of fabric, suspended from the balloon rigging by its central point, so that it hangs down in a straight line 30 feet or more below the balloon, the balloonist sitting on a trapeze swung below the parachute. When the rope is cut the parachute and its passenger fall freely for a considerable distance with increasing speed, the descent finally being checked when the inrushing air forces the sides of the parachute apart and expands it into the familiar umbrella form in which it offers the maximum resistance to the air. A small hole is ordinarily provided at the center of the parachute in order to make it open more quickly and to increase the stability, checking the swings from side to side which might otherwise become unpleasantly violent.

It is obvious that the balloon parachute cannot be applied to airplanes directly. There is no room for it, it takes so long to open that it would be useless in many instances, and it is likely to be insufficiently strong to stand the rush of air when a jump is made from an airplane traveling 100 miles an hour or more. The first of these difficulties was overcome at once, when

parachutes began to be used to safeguard the lives of military balloon observers after their balloons had been set on fire by enemy attack, by packing the parachute in a compact case which was attached to the side of the balloon basket. The observer in the basket wore a light harness which could be attached to the parachute cords almost instantaneously, and he had only to jump over the side of the basket in case it became necessary to abandon the balloon. His jump carrying him to the end of the parachute cords, the parachute was automatically snatched from its case and promptly opened.

#### Use in the War.

Although the parachute was in use for observation balloons from the time when serious military use began to be made of the balloons themselves, and although its use was naturally extended to airships, no strenuous attempt was made to take the further step of using a parachute to save the pilot in airplane accidents until the last year of the war, when the Germans began making tentative researches in that direction and a few German pilots actually jumped with parachutes from burning airplanes. Certain experiments in Great Britain were working privately on the problem at the same time, but parachutes were not actually utilized over the front by any of the aviators of the allied countries during the war. In 1919, however, intensive work began in the United States and elsewhere, and a number of satisfactory airplane parachutes have been developed as a result.

The airplane parachute differs from those used for other purposes chiefly in the method adopted for getting clear of the airplane itself and for forcing the parachute to open. It is evident that there would be great risk, if the airplane were continuing its forward progress at 100 miles an hour or more and if the parachute were attached to the airplane in accordance with observation balloon practice, that the parachute would foul some part of the airplane structure when pulled from the case and would hold the jumper suspended at the end of a rope, in a worse position than if he had never jumped at all. In fact, despite all the precautions taken, there has been one instance in which a passenger making a parachute descent from an airplane caught his arm in the rudder just after jumping, tearing the rudder completely off and badly lacerating the jumper's arm. Fortunately, the pilot of the airplane was able to reach the ground safely, despite this sudden removal of one of his controls.

#### The Delayed-Opening Type.

In order to guard against tangling of the parachute rigging in the airplane, and also to prevent the parachute from catching fire in a jump from a burning machine, what is known as a delayed-opening parachute has now been extensively adopted. This is carried in a small pack, weighing about 16 pounds, which the pilot or passenger wears on his back or on his chest, attached to the leather harness which is to carry the jumper's weight during the

descent. The chief characteristic of the delayed-opening type is that it has no tendency to open of its own accord after the jump has been made, and will not do so without action by the jumper, who pulls the opening cord after he is well clear of the airplane, which, in an actual accident, would presumably be in flames or falling steeply. The pulling of the cord opens the pack, and the parachute then opens with remarkable speed, so quickly with some types that exhibition jumps have been made from bridge towers only a little over 100 feet in height, as well as from airplanes flying at a height of only a few hundred feet.

All of this discussion of the type of parachute used and the method of using it serves in reality only as an introduction to the more important point, the probable usefulness of the parachute in flying, and particularly in connection with commercial flying. Some of its enthusiastic defenders foresee the day when every commercial aircraft must carry a parachute for every passenger, quite as ships now carry life preservers, and are already urging action toward that end. A moment's consideration, however, must show the folly of such a proposal. It must be remembered, in considering the use of a parachute, that the airplane accidents in which it would come into play would be comparatively rare. If an airplane were descending out of control the pilot would ordinarily continue his efforts in the expectation of regaining a normal flight path until it was too late for a parachute to open, and the only contingencies in which the parachute is likely to be called into use are those of fire in the air or

of a structural failure of some part of the airplane. These are two types of accident which never should occur and as a matter of fact do not occur in commercial airplanes.

Structural failure, in particular, should be absolutely impossible if there is proper governmental supervision over the type of airplane used, except in the rare event of collision in the air. Only in one case since the opening of the London-Paris air line, that of the collision over northern France about three months ago, has there been an accident in which there would have been the slightest chance of saving life by the provision of parachutes, and even there the altitude was so low that they probably would have done no good. In experimental aircraft, on the other hand, particularly those military types which are to be subjected to great strains by violent maneuvering, there is always the possibility of either fire or structural failure, and no pilot should ever fly such a machine without wearing a parachute. After the airplane has been thoroughly tried out and its structural strength amply demonstrated, the necessity for such precautions of course diminishes.

#### For Commercial Airplanes.

Quite aside from the improbability of any accident where a parachute would be useful, however, there are other reasons for doubting the value of parachutes in commercial aviation. The most obvious of these is the physical impossibility of using them. Commercial airplanes ordinarily fly in the neighborhood of 3000

feet above the earth (sometimes much lower) and, in case a structural collapse should occur, unprecedented though that would be, it would take only about 30 seconds to fall to the ground. In that time it would be necessary to open the cabin door, usually rather a low and narrow one, and for from three to ten people of all ages and both sexes to step out of that door into the open space with nothing to sustain them save their confidence in the little packs that they wore on their backs. Having jumped clear of the machine, it would be necessary for each of these passengers, while falling through the air at from 40 to 200 miles an hour, to find and pull the ring attached to their parachute harness which would allow the parachute to open. The thing is unthinkable.

The history of catastrophes at sea has shown over and over again that it is hardly possible to get a life preserver on every passenger and all the boats over the side, even when the ship takes several hours to go down. How much more difficult it would be to induce all the passengers of an airplane to make proper use of parachutes in less than half a minute.

This is not by any means a council of despair. The aim is, not to show that there is no means of increasing the safety of airplane travel, but rather to indicate the absurdity of pinning our faith to a particular safety device under conditions where it would be both useless and unnecessary. The aim of the aeronautical engineer should be and probably is the elimination of the accidents themselves rather than the calm acceptance of accidents

as an evil to be met only by providing every passenger with a heavy and awkward "aerial life-preserver" introducing hazards of its own.

